PUBLIC HEALTH REPORTS

VOL. 34 JUNE 27, 1919 No. 26

RESOLUTION OF THE SECTION ON PREVENTIVE MEDICINE, AMERICAN MEDICAL ASSOCIATION.

Health administrators the country over have often complained of the failure of a certain proportion of the physicians practicing in their community to make prompt reports of cases of communicable diseases as required by law. Yet it is well recognized that nothing is more important in order that the health authorities may take proper steps adequately to safeguard the health of the rest of the community.

The American Medical Association has repeatedly placed itself on record as binding its members to support public health work, and it is gratifying to learn that at the recent meeting of this association at Atlantic City the following resolution was adopted by the Section on Preventive Medicine and Public Health:

Resolved, That the Section on Preventive Medicine and Public Health of the American Medical Association recommend to the House of Delegates that it ask the constituent associations to consider the advisability of such amendments to their by-laws and to those of this association as will eliminate from membership any physician who willfully fails or refuses to comply with local or State laws for the prevention of disease, including especially the provisions in such laws requiring the reporting of cases of communicable disease.

The enforcement of such an amendment to the by-laws as here proposed would be of incalculable value to the public health movement. It would make it possible to bring delinquent physicians before a court consisting entirely of their peers. This would make the American Medical Association insist that membership in the association depend on the faithful performance of the physician's duties not only to his patients, but to the public at large.

The association is to be congratulated on thus squarely accepting the responsibilities placed upon its members. Such cooperation is indeed appreciated by health administrators everywhere.

OBSERVATIONS ON THE BACTERIOLOGY OF INFLUENZA.[1]

By EDWIN O. JORDAN, Consultant in Bacteriology, United States Public Health Service.

These observations were made upon (A) patients affected in an epidemic in the Student Army Training Corps of the University of Chicago, (B) civilian influenza patients in various hospitals in the

[1] The author wishes to acknowledge his indebtedness to Dr. J. F. Norton and Miss Elizabeth Arentz for assistance in this work.

vicinity of the University of Chicago, (C) patients, mainly university students, who developed influenza in December, 1918–February, 1919, after the main Chicago epidemic had subsided, and (D) cases of tonsillitis, "colds," and other respiratory tract affections occurring during and subsequent to the epidemic. An attempt was made in Groups A, C, and D to study a few cases in great detail, making frequent and very thorough bacteriological examinations. In one case of influenza-pneumonia, for example, observations extended over a period of 36 days until convalescence was complete and the patient was discharged, and included sets of plate cultures on 25 different days.

One object especially in view was the determination of the relative frequency and abundance of the Pfeiffer bacillus in the upper respiratory tract of persons suffering from influenza and from common, nonspecific respiratory tract infections. Another was a series of similar observations upon the diplo-streptococcus described by Mathers.[1] Variations in the nose and throat flora throughout the illness of one and the same individual were also particularly noted.

Methods.—In the majority of cases swabs were made from the nose, tonsils, and nasopharynx; the nasopharynx swabs were obtained by the Mathers bent-wire method as used in meningococcus-carrier work.[2] Nasal swabs usually failed to give results materially different from the others and in the later cases were omitted.

As soon as made, the swab was smeared on freshly poured warm-blood agar plates, which were kept warm en route to the incubator. The meat infusion agar was prepared with 2 per cent peptone and made neutral to phenolphthalein; it has proved well adapted to the growth of pure cultures of the Pfeiffer bacillus. Human blood and sheep blood (5 per cent) were chiefly used; no material difference was noted. From the smear, radiating streaks were made with a platinum loop [2] and crossed after burning off the needle. Well-separated colonies are usually obtained in this way. It has been found advantageous to have plates poured on the day they are used, or at most not more than 24 hours before use. Special care was taken to keep the air of the incubator moist. If the surface of the plate is dry when inoculated, or if the air of the incubator is not sufficiently moist, growth of the Pfeiffer bacillus may be unfavorably affected. The plates were examined after 24 hours and again after 48 hours; a hand lens was always used. In the present series particular attention was paid to the occurrence of the Pfeiffer bacillus and the green-producing streptococcus isolated by Mathers.[1] Other bacteria, when present in noteworthy numbers, were also isolated and examined. As a rule, several colonies from each plate were circled and fished with a platinum loop to a fresh plate; if this second plate was a pure culture, appropriate

[1] Jour. Amer. Med. Assoc., 1918, 71, p. 1733.

[2] "Standard Technique of Meningococcus Carrier Detection," published by the Medical Departments of the Army and Navy and the United States Public Health Service.

diagnostic tests were made. Heated blood-agar plates on which the Pfeiffer bacillus grows with special luxuriance were used in many cases, together with the standard blood-agar plates, but their use has not been essential for the isolation of the Pfeiffer bacillus which has grown freely upon the plain blood-agar medium which we used.

The well-known favoring influence of hemolytic colonies upon the growth of the Pfeiffer bacillus has been often observed; it has also been noted that the colonies of certain nonhemolytic bacteria have a similar stimulating effect which is quite as marked. In cases in which the growth of the Pfeiffer bacillus on the first plates was scanty after 24 hours, we sometimes obtained much larger colonies by streaking the plates with one of the growth-favoring organisms and incubating for 24 hours longer. Occasionally the original plate was too crowded for proper examination, and in such cases a second plate was made from it before fishing. Two points have seemed of special importance in the successful isolation of the Pfeiffer bacillus, particularly when this organism is present in small numbers: First, the incubation of the plates for two or three days; second, the use of the hand lens.

Sputum was examined when it was possible to obtain it. Direct stains were made and also smears on blood-agar plates in the usual way. When, as is often the case in uncomplicated influenza, sputum in washable quantity was unobtainable, we had the patient cough directly upon a blood-agar plate. Little flakes of mucus were sometimes discharged, and after 18–24 hours the growth surrounding these mucous droplets was transferred with a loop to a fresh plate. In this way the Pfeiffer bacillus has been isolated several times when the other sources of examination failed to yield it.

Blood cultures.—Blood drawn from the elbow vein (about 10 cc in each case) was added to warm broth (200 to 500 cc) and incubated for about a week. The observations comprised 11 cases of uncomplicated influenza and 8 of influenza-pneumonia. In the plain influenza cases blood was drawn on the first day in 2 cases, on the second day in 5, and in 1 case each on the third, fourth, fifth, and seventh days. In the pneumonia following influenza the blood cultures were made, respectively, on the fourth (2), fifth (1), sixth (1), seventh (2), eighth (1), and twelfth (1) days. All were sterile.

The Pfeiffer bacillus.—The small, translucent colonies on blood agar can often be identified with a high degree of certainty with the hand lens, particularly if they are numerous, in which case the heaping-up around large colonies of staphylococci and other bacteria is highly characteristic. For definite identification it has been our practice to transfer single, isolated colonies to a fresh plate; if typical growth was obtained, failure to grow on plain agar together with characteristic morphology and gram-stain reaction were regarded as sufficient identification marks. A strong, luxuriant growth can be

obtained on agar prepared with heated blood, but except for obtaining large quantities of material for inoculation experiments this medium presents no noteworthy advantages over the ordinary clear medium. It is not particularly well adapted for isolation.

It is of interest that a medium made without meat infusion, meat extract, or peptone—simple agar dissolved in physiological salt solution—to which 5 per cent of blood is added in the usual way—yields a scanty, but undoubted growth of the Pfeiffer bacillus.

For preserving cultures it is safest to make daily transfers, though if the air of the incubator is kept moist the Pfeiffer bacillus can retain its vitality for a considerable period in the incubator. We have frequently obtained growth from tube cultures that had been in the incubator for from two to three weeks. The heated blood medium is better than the ordinary blood medium for maintaining vitality.

The Mathers coccus.—This organism was isolated by the late Capt. Mathers during the influenza epidemic in September, 1918, at Camp Meade. A culture kindly furnished me by Miss Tunnicliff possessed the characters described in her paper.[1] It resembles the ordinary mouth streptococcus in some of its characters, but the colonies on blood agar are much like those of the pneumococcus, although, as a rule, larger, moister, and more confluent. It is gram-positive, usually with pointed ends and in pairs. It is not soluble in bile, and most strains ferment neither inulin nor mannite. Morphologically and in colony growth it is closer to the pneumococcus than to the streptococcus, but the fermentation characters are those of the ordinary mouth streptococci.

A coccus with these characters was found in a large percentage of the cases examined, not infrequently in practically pure culture, especially in cultures from nasopharyngeal swabs. One hundred and eight strains obtained at different times from 44 different cases were subjected to careful examination. All were gram-positive, had the morphology described above, and gave a heavy, moist, green, confluent growth on blood agar. Table I shows their close relationship to strains of *Streptococcus buccalis* (Blake's classification) isolated in this same series of cases, although in morphology and in appearance of the growth on blood agar the difference is sharp.

TABLE I.

Number of strains.	Bile solubility.		Fermentation.						Remarks.
			Lactose.		Inulin.		Mannite.		
	+	−	+	−	+	−	+	−	
108	.....	108	105	3	4	104	5	103	Mathers coccus.
85	.....	64	84	1	2	62	1	63	Streptococcus buccalis.
27	27	.....	27	.....	22	5	22	5	Pneumococcus IV.

[1] Jour. Amer. Med. Assoc., 1918, 71, p. 1733.

Attempts to differentiate the Mathers coccus and *Streptococcus buccalis* by testing their fermentation powers on a larger number of carbohydrates have given negative results. A comparison of 10 strains of each gave results as follows: Positive—lactose, saccharose, maltose (1 strain of *S. buccalis*, negative), galactose (1 *S. buccalis*, negative; same strain negative in maltose), mannose (2 *S. buccalis*, negative); negative—inulin, mannite, arabinose, raffinose, sorbite, and dulcite. Type pneumococci (I, II, and III) gave similar results with these carbohydrates, except that inulin and mannite were fermented by all.

The methods of observation of the cases studied are illustrated in Table II.

TABLE II.

CASE 21 (Influenza-pneumonia).

Day of disease.	Temperature.	Leucocyte count.	Pfeiffer bacillus.	Mathers coccus.	Other bacteria.	Remarks.
Second	103	7,300	−	+	Pneumococcus IV, M. catarrhalis.	M. catarrhalis more abundant than any other on these dates.
Third	102	5,500	−	+	M. catarrhalis	
Fourth	103	5,000	−	−	do	
Fifth	103	3,700	−	−	Many diphtheroids	
Seventh	104.2	4,600	−	−	Many staphylococci	
Eighth	104	4,200	−	−	Many diphtheroids and streptococci.	
Ninth	103.2	6,200	−	−	Many staphylococci	Almost pure culture of staphylococci in nasopharynx. This is rather unusual.
Fifteenth	100.4	9,900	+	−	S. buccalis (Pfeiffer bacillus very abundant).	
Eighteenth	99.4	14,400	+	+	Some diphtheroids	
Twenty-first	98.4	14,200	+	+	S. buccalis	
Twenty-sixth	98	[1] 12,000	+	−	do	
Thirty-seventh.	98	7,800	−	−	Streptococcus buccalis; M. catarrhalis.	

CASE 24 (Uncomplicated influenza).

First	102	.....	−	−	Staphylococci	
Second	102	6,000	−	−	Diphtheroids	
Third	100.6	5,400	−	−	Diphtheroids; M. catarrhalis.	
Fifth	99	.....	+	−	M. catarrhalis	
Sixth	99	8,000	+	−	B. mucosus capsulatus	
Eighth. Discharged.						

CASE 66 (Uncomplicated Influenza).

First	103	4,900	−	+	A few S. buccalis	Almost pure culture Mathers coccus.
Second	100	.....	−	+	do	
Third	100	.....	−	+	Staphylococci	Mathers coccus not nearly so abundant as on preceding days.
Fifth	97.6	.....	+	+	Many staphylococci	Few if any bacteria besides Pfeiffer bacillus and Mathers coccus.
Seventh	97	[2] 7,460	+	+	.....	
Ninth	97	7,300	+	+	.....	Mathers coccus abundant.
Fourteenth. Discharged.						

[1] Twenty-fourth. [2] Sixth.

In all, 47 cases of influenza were studied in this way. The distribution of the Pfeiffer bacillus and the Mathers coccus was as follows:

TABLE III.

Group.	Number of cases examined.	Number in which Pfeiffer bacillus was found.	Number in which Mathers coccus was found.
A1. Uncomplicated influenza, October	11	8	4
A2. Influenza-pneumonia, October	8	3	8
(Groups A1 and A2 in same epidemic.)			
B. Hospital influenza and influenza-pneumonia	17	11	8
C. Uncomplicated influenza, December–February	11	8	11
Total	47	30	31

Arrangement in such a numerical table has its limitations and does not give a complete picture of the findings, since most of the cases in Groups A1, A2, and C were examined many times, while nearly all of those in Group B were examined only once. Groups A1 and A2 are fairly comparable with one another in respect to the number of observations in each case, and so far as the examination of this limited number of cases from one localized epidemic is concerned, there is no doubt that Pfeiffer bacilli occurred more frequently and more abundantly in the uncomplicated influenza cases than in those in which pneumonia developed.

Comparison of the tabular record for Groups A1 and C, on the other hand, might be misleading, since the Pfeiffer bacillus was present in much larger numbers in the December–February cases (Group C) than in the October cases (Group A1). Whereas in the earlier cases Pfeiffer bacillus colonies were relatively infrequent compared with the numbers of other bacteria, in the later cases there were many plates in which the Pfeiffer bacillus and the Mathers coccus were practically the only organisms present. Considering the number of colonies of Pfeiffer bacillus on each plate and the proportion of daily observations that were positive, the actual abundance of this organism in the upper respiratory tract was far greater in the later cases than in the cases observed during the height of the epidemic in Chicago. The contrast between the cases in Group B and those in Groups A1 and A2 (Table III) was even more pronounced. Although the total of examinations in the hospital cases was much smaller, the Pfeiffer bacillus was present in a relatively high proportion of the plates examined and usually in great numbers. The significance of relative abundance as disclosed by plate culture is somewhat problematical and the bearing of such facts upon the rôle of the Pfeiffer bacillus must be regarded for the present as quite uncertain.

In 18 cases in which the Pfeiffer bacillus was found, examinations made on the first to the third day of the disease showed this organism present in 8, the Mathers coccus in 11 cases; in 7 cases neither of these

organisms was found on the first three days of the disease. In 6 of the 10 cases in which the Pfeiffer bacillus was not found on the first three days, it was found later (see, e. g., Table II, cases 24 and 66). The Mathers coccus, when present at all, was always found on the early days of the attack.

Other bacteria.—The usual bacteria of the upper respiratory tract were found in most of the cases, although in greatly varying numbers, both in different individuals and in the same individuals on different days. The men in the Section B epidemic group (Table I, Groups A1 and A2) harbored a far greater variety of bacteria than patients from other sources. The close contact of these men with one another during their preliminary illness and in the emergency hospital evidently favored a generous transfer of bacteria from throat to throat. The result was that at the time of our examination the variety of bacteria that had found a congenial soil was very large. Diphtheroids were especially numerous and were found abundant in all the earlier cases. *M. catarrhalis* was also very commonly present, often in great numbers. (See Table II, case 21.) *S. buccalis* occurred in varying numbers, but was rarely very abundant. In many of the Section B cases in October a large gram-negative diplococcus was present which formed very delicate, translucent colonies and died out readily even when transferred frequently on blood-agar. It grew in the first generation very scantily on plain agar and since it did not ferment dextrose it is perhaps to be regarded as belonging to the *M. catarrhalis* group, although under the conditions of our work it proved a much less vigorous organism than *M. catarrhalis* or than the Pfeiffer bacillus.

Pneumococci were found in 10 cases, but several strains were irregular in respect to inulin and mannite fermentations. All but one (IIa) fell in Group IV on application of the agglutination test.

The Friedländer bacillus was found in 4 cases, in one of these in large numbers.

Hemolytic streptococci were found in 7 cases, all but one of these in the later stages of the epidemic; in 5 cases they were numerous. In one patient no hemolytic streptococci were observed during the primary attack (3 sets of examinations). Twelve days after recovery and discharge, the patient was readmitted with a temperature of 104° and subjective symptoms described as being very similar to those of the original attack; hemolytic streptococci were present in practically pure culture in the throat and nasopharynx. This second attack or relapse was of short duration and the patient was discharged five days later. Bacteriologically, it appeared like a new infection with an organism not originally present. The leucocyte count on the fourth day of the second attack was 14,500. A second case of the same nature was found later.

Bacteriology of colds, etc., during the epidemic.—Twenty-eight cases of tonsillitis, sore throat, and common cold among university students were examined—about half of these (13) while the influenza epidemic was at its height in October–November, 1918, the others in January–March, 1919, after the influenza cases had practically disappeared from the neighborhood. The organisms most commonly found on blood-agar plates were as follows:

Total cases examined	28
Mathers coccus	15
Hemolytic streptococci	12
Pneumococcus IV	7
Pfeiffer bacillus	4

The Friedländer bacillus was found once in abundance and *M. catarrhalis* was found several times, though not in large numbers.

Observations on these cases were made in precisely the same manner as that of the observations upon the influenza cases. Typical records in Table IV may be compared with the influenza records in Table II.

TABLE IV.

Day of disease.	Temperature.	Leucocyte count.	Pfeiffer bacillus.	Mathers coccus.	Other bacteria.	Remarks.
CASE 100 (Common cold).						
Second	104	8,900	–	–	M. catarrhalis	
Sixth	101.6	8,160	–	–	Hemolytic streptococci	
Seventh	102	7,800	+	–	S. buccalis	
CASE 101 (Severe cold, sore throat).						
Third	102	10,500	–	–	M. catarrhalis	
Fifth	100	8,100	+	+		
Sixth	99	7,900	+	+	Pneumococcus IV	
Seventh		6,000	–	+		
Eighth		5 400	–	+	S. buccalis	
Thirteenth	100	10,200	–	–	do	
Fourteenth	99	7,600	–	+	do	
CASE 103.						
First	98	12,900	–	+	Pneumococcus IV, S. buccalis.	
Second	98		–	+	Pneumococcus IV, S. buccalis, M. catarrhalis.	
Fourth	98	10,300	–	+	do	
Fifth	98	7,800	–	+	S. buccalis, M. catarrhalis.	
Seventh	98	6,600	–	+	Pneumococcus IV, S. buccalis, M. catarrhalis.	
CASE 111 [1] (Tonsillitis).						
Second	102	9,700	–	+	Hemolytic Streptococci	Almost pure culture hemolytic streptococci; very few other colonies.
Fourth		13,400	–	+	S. buccalis	

[1] Case 111 was one of 4 cases of tonsillitis developing at the same time, and all with a history of exposure at a party 18–24 hours before attack. All 4 cases showed leucocytosis during the first 4 days of the attack, the maximum ranging from 13,400 in one case to 20,800 in another. Three of the cases showed a relative increase of the neutrophils (82 to 86 per cent). The bacteriological picture as shown in throat and nasopharynx swabs was remarkably similar. Hemolytic streptococci were very abundant on all plates and were by far the predominating organisms. In one case pneumococcus IV was present in small numbers in one examination, but in the other only a few colonies of the Mathers streptococcus and of S. buccalis were found in addition to the hemolytic streptococci. Between the first and second examinations two throat treatments with methylene blue were given, but the character of the flora of nasopharynx and throat was not appreciably altered by this procedure.

The clinical picture of these common endemic respiratory tract infections was distinctly different from that of epidemic influenza, although many of the symptoms were similar and the attack, at first, was frequently regarded by the patients and others as influenza. Headache, dizziness, and pain in the joints and limbs were common accompaniments of these cases, and in some instances the onset was sudden. On the other hand, sore throat was much more frequent and pronounced than in the cases of epidemic influenza, and patches were often observed on the mucous membrane. In the majority of cases the temperature did not run above 102°, and the fever was not prolonged beyond 24–48 hours. The leucocyte count was high in nearly all these cases. Thirty-nine leucocyte counts made in 20 cases, usually on the two days of the height of the attack, gave an average of 11,500. The range was as follows:

Above 10,000	22
7,000–10,000	11
Below 7,000	6

In only one case was the leucocyte count similar to that observed in the majority of cases of true influenza. In this case (107) the leucocytes were: Third day, 6,700; fourth, 4,500; fifth, 5,200; seventh, 5,100. The symptoms were not unambiguous: Headache, pain in back, no sore throat, no cough, no nosebleed. The temperature was not high (second day, 101.8) and quickly subsided (third day, 98.6) and none of the symptoms was severe. The predominating organism on the third, fourth, and fifth days was the Mathers coccus, although some pneumococci Type IV were found on the fourth and fifth days. On the seventh day many Friedländer bacilli were found. This case may have been one of light influenza, but there were no other cases in the neighborhood or among the associates of (107) at this time (Feb. 2–8, 1919).

In comparing the October–November cases of cold with those in January–March the most conspicuous difference was the much larger number of cases with hemolytic streptococci and with pneumococci (Type IV) in the latter group.

TABLE V.—*Bacteria in cases of cold, etc.*

	Number of cases.	Hemolytic Streptococci.	Pneumococcus IV.	Mathers coccus.	Pfeiffer bacillus.
Height of influenza epidemic, Oct.–Nov., 1918	13	2	1	4	1
After subsidence of influenza epidemic, Jan.–Mar., 1919	15	10	6	11	3

The richer flora in the second group of cases may be connected with the greater severity of these cases, and this in turn may be dependent upon the season of year. At all events, the relatively mild cases

of common respiratory tract infection that were examined during the height of the influenza epidemic did not harbor the Pfeiffer bacillus in nearly as high proportion as did the influenza cases examined at the same time; neither did they, except in a few cases, harbor in abundance hemolytic streptococci, pneumococci, or the Mathers coccus. In several cases the only organism growing in any considerable numbers on blood agar plates was the common mouth streptococcus (*S. buccalis*).

The association of large numbers of hemolytic streptococci (var. Beta) with cases of tonsillitis, and generally with cases of severe throat inflammation, was markedly evident in this series. This corresponds with the relative scarcity of this organism in the cases of true influenza, in which as a rule sore throat was not observed.

Leucocyte counts.—In the course of these observations leucocyte counts were made, as a rule, on the same days when throat swabs were taken. The average counts in simple influenza showed a leucopenia, as recorded in Table VI. The term "simple influenza" is here used to designate those cases not showing signs of clinical pneumonia. The patients usually regained a normal condition by the end of the first week, although with the ordinary aftermath of weakness.

TABLE VI.—*Leucocyte counts—simple influenza.*

Days of disease.	Cases.	Total leucocytes.	Polymorphonuclears. *Per cent.*	Lymphocytes. *Per cent.*	Large mononuclears and transitionals. *Per cent.*
Second and third	13	6,100	63	28	9
Fourth and Fifth	9	4,900	62	33	5
Sixth and seventh	6	6,100	59	32	9
Eighth to twelfth	10	7,500	66	25	9
Twelfth to thirtieth (after full recovery and discharge)	8	9,100	60	34	6

Eosinophiles were generally absent during the attack.

Individual cases sometimes showed considerable deviation from the average. In one case the lowest count (4,300) was not reached until the eighth day of the disease. Several cases without any apparent complication gave leucocyte counts of over 10,000 for a week or more after seemingly complete recovery. In general, the counts ran rather high for some time after the patient was able to return to his ordinary vocation.

Similar observations on the influenza cases in which clinical pneumonia developed showed a drop in the number of leucocytes similar to that recorded above, but after a longer or shorter interval this was followed in each of the cases here observed by a moderate leucocytosis (14,000–15,000) which, however, in one case (cf. 21, Table II) did not

appear until about the fifteenth day. The differential ratio was not appreciably altered in these cases. Quite different is the normal leucocyte count in ordinary colds, tonsillar inflammations, etc.

TABLE VII.—*Leucocyte counts—colds, etc.*

Days of disease.	Cases.	Total leucocytes.	Polymorphonuclears.	Lymphocytes.	Large mononuclears and transitionals.
			Per cent.	*Per cent.*	*Per cent.*
First, second, and third	22	12,600	73	22	5
Fourth and fifth	8	11,600	74	20	6
Sixth and seventh	7	8,800	69	25	6
Eighth to fourteenth	3	7,200	68	25	7

Comparison with Table VI brings out very plainly the average differences in total leucocyte counts. Whether the slight divergences in the differential count that appear in these figures have significance will need a larger number of observations to determine. As already stated, several cases have been observed in the course of this study which, clinically, seemed more like colds than like true influenza, but which had a low leucocyte count throughout. In the absence of any definite diagnostic criterion the relationship of these infections to true influenza must remain uncertain.

Summary.

The bacteriological picture in influenza is not a uniform one so far as nose and throat flora are concerned. The ordinary methods of cultivation with blood agar plates show marked differences in individual cases. Groups of individuals who have been in more or less intimate contact with one another may harbor very similar assemblages of microorganisms, but differ from other groups examined at the same time. The variations in respiratory tract flora reported by many observers during the progress of an influenza epidemic are doubtless, in part, group differences.

Daily examinations of a number of selected typical cases, mild and severe, have shown no one organism constantly demonstrable in large numbers by the methods employed. The two organisms most commonly and abundantly present in this series were the Pfeiffer bacillus and the diplococcus or streptococcus found by Mathers at Camp Meade.[1]

The Pfeiffer bacillus was found in 64 per cent of the influenza cases examined between October, 1918, and February, 1919. It was present in much larger numbers in the throats of the patients examined toward the end of the outbreak. Several cases did not come under observation until clinical pneumonia had developed and in these cases the Pfeiffer bacillus was not found as frequently as in the

[1] This is apparently very similar to, if not identical with, the organism described by Zingher, Jour. Amer. Med. Assoc., 1919, 72, p. 1020.

"uncomplicated" cases. Other cases for various reasons could be examined only once or twice, and the findings are not strictly comparable with those in which daily examinations were carried out. The percentage of positive findings would probably have increased if all patients had been subjected to examination throughout the course of the attack. The relative abundance of the Pfeiffer bacillus varied greatly. In some cases it was the predominant organism; in others only a few colonies could be found, no more than in normal throats. It did not often happen in this series that hemolytic streptococci (var. Beta) and the Pfeiffer bacillus were both present in large numbers. On the other hand the Pfeiffer bacillus and the Mathers coccus often had the field almost to themselves. In a few cases the Pfeiffer bacillus was present in such overwhelming numbers in cultures from nose, nasopharynx, and throat, that participation in a pathologic process was strongly suggested. These cases, however, did not differ clinically in any appreciable way from other cases in which the Pfeiffer bacillus was found scantily.

The Mathers coccus was found about as frequently and abundantly as the Pfeiffer bacillus, although its occurrence was quite independent of that of the latter. Its association with the pneumonia cases seemed to be closer than that of the Pfeiffer bacillus, but it was also found in all the later cases of simple influenza. Variations in the abundance of this organism were quite as marked as were those of the Pfeiffer bacillus and no relation could be demonstrated between these findings and the characters of the cases. Practically pure cultures of the Mathers coccus were obtained from the nasopharynx of some patients.

Comparison of the true influenza cases with colds and tonsillar infections showed that the general leucopenia of the influenza cases could be contrasted with the general leucocytosis of the others. Blood counts made during the first four or five days of the attack practically invariably showed at some time a leucopenia in the influenza cases and a leucocytosis in the others. The chief differences in the bacterial findings were the relative infrequency of the Pfeiffer bacillus in the colds, etc. (14 per cent), and the relatively high proportion of hemolytic streptococci (var. Beta). The Mathers coccus was present in about the same proportion of cases as in influenza.

The pneumococcus was found in about 20 per cent of the influenza cases (10: 47) and in a slightly larger proportion in the cases of rhinitis and tonsillitis (7: 28). No special search was made for these organisms, and it is probable that positive findings would have been increased somewhat if mouse inoculation could have been made whenever throat swabs were taken. Washed sputum, when procurable, was inoculated into mice, but the pneumococcus was not invariably isolated. In two cases as much as 2 cubic centimeters of

washed sputum from influenza patients, injected intraperitoneally, did not lead to the death of the mouse. The pneumococci isolated from both influenza and rhinitis cases were all Type IV, except one strain (IIa).

M. catarrhalis, the Friedländer bacillus, and an unidentified gram-negative diplococcus were found at times in large numbers in the throat, nose, and nasopharnyx of influenza cases. Staphylococci were also sometimes present in great abundance.

Two observations on suspected cases of "recurrence," or "second attack," have shown the presence in the throat of organisms (hemolytic streptococci) not found during the original attack. Both recurrences presented some of the clinical symptoms of influenza, but had a moderate leucocytosis. A third case of suspected "recurrence" likewise showed hemolytic streptococci in the throat and slight leucocytosis, but this patient had not been under our observation during the primary attack. It seems probable that an alleged "second attack" of influenza, occurring within a few weeks of the original attack, is, at least in some cases, a new infection with another organism.

The observations carried out by the aerobic blood agar plate method and recorded in this paper have not shown the predominance or constant presence of any one organism in the upper respiratory tract of influenza patients. The Pfeiffer bacillus, however, has been more conspicuous than any other organism, particularly in comparison with its relative infrequency in cases of rhinitis and tonsillitis examined during the same epidemic period.

POPULAR LEAFLETS ON BABY HYGIENE.

In a recent number of the Public Health Reports attention was called to the importance of health activities during the neonatal period. It is well known that the hot weather regularly brings with it an increase in mortality in this important age period. In an effort to assist State and local health officers in the educational work required to combat excessive infant mortality the Public Health Service has prepared a number of bulletins intended for popular instruction. These are available in quantity for free distribution by health officers. Requests, stating the quantity desired, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C.

Fly poster—How the fly spreads disease.

The Care of the Baby. Supplement No. 10 to Public Health Reports.

The Summer Care of Infants. Supplement No. 16 to Public Health Reports.

The Transmission of Disease by Flies. Supplement No. 29 to Public Health Reports.

Safe Milk. Supplement No. 31 to Public Health Reports.

Safe Milk for the Small Town. Reprint No. 497 from Public Health Reports.

The Homemade Milk Refrigerator. Public Health Bulletin No. 102.